# Armand Bayou Nature Center

## Prairie Rising:
## The ecology and restoration of a local coastal tallgrass prairie

When the first European explorers emerged from the dense northern forests of America, they could scarcely believe their eyes. A "fruitful champayne countrie," a treeless ocean of wildflowers, birds and animals, and grasses nine feet high, stretched and unbroken to the distant horizon. The explorers named it "prerie," meaning "grassland" or "grassy orchard."

- John Madson

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# INTRODUCTION

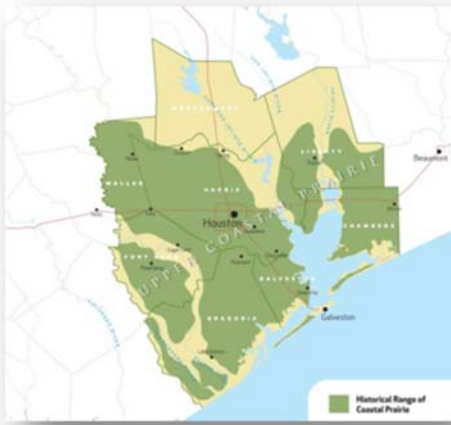
Coastal tallgrass prairie exists in a very thin margin extending approximately fifty miles inland along the Gulf of Mexico from Corpus Christi, TX to the Louisiana coast. Its close proximity to the ocean results in frequent rainfall events, creating a prairie ecosystem that has more wetland features than prairies located in the Great Plains region. The coastal tallgrass prairie has one of the most diverse plant communities in North America. Remnant prairies may contain as many as 1,000 different plant species, many of which produce a changing array of colorful flowers throughout the growing season. Despite this, prairies continue to be one of the most underappreciated ecosystems. Throughout the country 99% of coastal tallgrass prairie has been lost, making it one of the most critically imperiled habitats in North America.


*Prairies are more than grass. This beautiful bloom of blazing star can be seen while participating in ABNC's wildflower hayride tour.*

Historically, coastal tallgrass prairie was the predominant landscape throughout the Houston area. Due to soil type and distribution, trees were mostly found directly adjacent to waterways. However, the reduction of prairie habitat in this area has been severe. Currently, Armand Bayou Nature Center is home to one of the largest remnant tallgrass prairies around Galveston Bay.

Armand Bayou Nature Center actively manages 900 acres of coastal tallgrass prairie annually. ABNC is a 501 (c) 3 institution that contains 2500 acres of coastal tallgrass prairie, tidal marsh, and forested ecosystems. The mission of ABNC is to preserve these ecosystems and provide opportunities for visitors to experience the diverse flora and fauna found in these habitats.


Map courtesy of Katy Prairie Conservancy



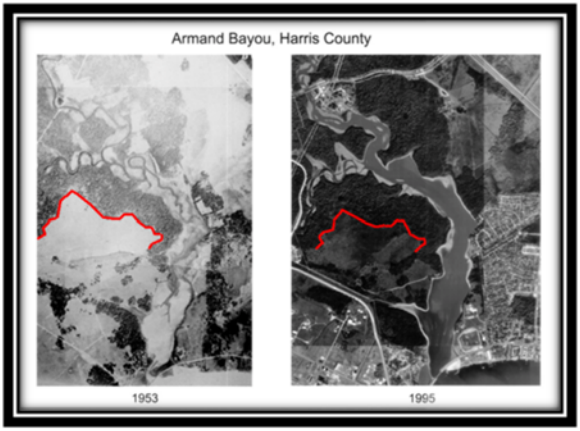

**Map courtesy of Katy Prairie Conservancy**

*Prairies are Houston's ecological heritage. Chances are that where you live was once prairie.*

# ABNC RESTORATION HISTORY

Armand Bayou Nature Center has a lengthy history of restoring coastal prairie. Since 1979, a team of staff biologists and dedicated volunteers has implemented an integrated management strategy, which includes prescribed burning, mowing, invasive species control, native plant cultivation and installation, vegetation monitoring and prairie education. Today, ABNC is a leader in prairie restoration in the Houston area. A typical year of prairie management includes applying prescribed fire to approximately 300 acres, mowing approximately 250 acres, controlling 50 acres of invasive species through selective herbicide treatments, cultivating approximately 20,000 one gallon pots of locally rare grasses and wildflowers, and installing those prairie plants through service learning projects. Additionally, we collect important plant data every spring and fall from 32 vegetation transect lines and teach the community to appreciate the subtle ecology and vanishing nature of this imperiled habitat. Through this assorted effort, ABNC prairies are healthier and more beautiful today than ever before!


*Armand Bayou Nature Center is an island ecosystem surrounded by industry and urban development.*




*Chinese tallow populations may quickly convert diverse prairie plant communities into a biological desert. The 1953 image shows the prairie untouched by Chinese tallow. Approximately 4 decades later, the right image reveals the impact of this exotic invader as it consumes the prairie.*

# PRAIRIE ECOLOGY

## What is a Prairie?

Grasses are the dominant vegetation found in coastal tallgrass prairies. The dominant grass species include big bluestem, eastern gamma grass, switchgrass, yellow indiangrass, and little bluestem. Historically, 80% of the prairie would have been covered by these few species. As indicated by the name, tallgrass prairies consist of grasses that can reach 7 feet in height. I nterestingly, prairies are known as 'upside down' plant communities because the bulk of a prairie community's biomass occurs below the soil surface.

### WHY PLANT GRASS?

When American settlers introduced cattle into permanent pastures, prairie grasses were forced to endure constant grazing pressure. After years of this high intensity, constant grazing, ABNC lost virtually all of the original, dominant grasses. Today the nature center plants these missing species in an effort to reestablish the historic, diverse plant community.

## The Land that was Built by Fire

Over many thousands of years prairie plants have evolved special growth strategies which enable them to endure the intense heat generated during regularly occurring prairie fires. Unlike prairie grasses, the bulk of the tissue of trees and shrubs is located above ground and is often severely damaged by fire. Conversely, grasses and prairie plants are considered fire adapted and have the majority of their tissue located below the soil surface, where it is insulated from the heat. During the winter months, prairies are covered in dead dormant grass thatch and lack any above ground physiological activity. At this time, they are low in moisture content which makes them very susceptible to fire. In turn, prairie plants are stimulated by fire. The blackened prairie soil absorbs the sun and warms, becoming conducive to nitrogen fixing bacteria. Nitrogen, a growth-limiting element for plants, is converted by these bacteria to a form useable by the prairie vegetation. As a result, prairie plants in a post-burn environment grow with vigor.

***Prairie Fact:***
*before 1800, there were over 9 million acres of coastal tallgrass prairie in Texas and Louisiana. Today less than 90,000 acres remain..*

## Where the Buffalo Roam

Before Europeans came to this country, an estimated 60 million bison roamed throughout North America. Some herds were thought to be as large as 20 miles wide and 60 miles in length. As these herds made their way across the country in search of green pastures, their grazing effects shaped the prairie landscape. Bison would rub on trees and shrubs, pushing them down as they moved through. The leading edge of the bison heard had access to the preference plants, those that tasted better and had a greater nutritional benefit for the

animals. The bison at the back of the herd were forced to graze on any vegetation remaining, including woody shrubs. This high intensity, low frequency grazing strategy was essential in keeping prairies free of woody vegetation.


*Some bison herds may have been as large as Harris County!*

## Wetlands Working for You

Coastal tallgrass prairies are commonly categorized as wetlands. Subtle changes in the elevation create depressional wetlands, or prairie potholes. These shallow wetlands are temporary and change with the seasons. During the summer months, many of these wetlands are difficult to identify because they hold no water. However, prairie potholes frequently hold water during the winter months with predictable rainfall and cool air temperatures that help to minimize evaporation. These “here today- gone tomorrow” prairie wetlands are a great asset to people in providing storm water retention and reducing flooding. In addition, they provide a water source for wildlife and a habitat conducive to amphibian reproduction.

The clean water act only provides protection for wetlands that are adjacent to a navigable waterway. Since prairie potholes are often isolated, they are largely unprotected by current legislation.

*Prairie wetlands are an important filter improving water quality before it enters Galveston Bay.*

## WHERE HAVE ALL THE PRAIRIES GONE?

The significant reduction of coastal tallgrass prairie habitat over the past 200 years has made it one of the most endangered ecosystems in the country. The two key ecological processes that sustain prairies have, over many years, been altered by human influence, allowing trees and woody shrubs to invade areas that once supported a climax community of grasses and wildflowers.

***Climax Community:***
*An ecological community in which populations of plants or animals remain stable and exist in balance with each other and their environment. A climax community is the final stage of succession, remaining relatively unchanged until destroyed by an event such as fire or human interference.*

ABNC burns 1/3 of its prairie every winter, 25 acres at a time.

## The Great Slaughter

Once bison began to disappear from the landscape, prairies began to change dramatically. Bison were a keystone species in the prairie ecosystem and as Europeans began to settle throughout North America, they were hunted and killed by the thousands. Many accounts of the slaughter described how the bison continued to graze as bullets flew all around them. Adult bison had few natural enemies and nothing in their history had prepared them for humans armed with rifles. Bison populations prior to 1700 were estimated to be around 60 million individuals. Following the civil war, the commercial hide hunt known as "the Great Slaughter" began. Bison were skinned for their hides and the carcasses were left to rot on the prairie. By the late 1800's, American Bison were nearly extinct.

***Keystone Species:*** *a species that plays an essential role in the structure, functioning, or productivity of a habitat or ecosystem.*

The Great Slaughter not only decimated the population of an iconic American animal, but it also played a significant role in destroying prairie habitat throughout the country. Without the high intensity, low frequency grazing of bison, woody shrubs began to take over areas where trees had historically been absent.

## The Land Without Fire

The other essential ecological process that supports a healthy prairie habitat is fire. Grasslands are considered fire dependent ecosystems. Before humans occupied North America, fires were ignited by lightning strikes. These fires would often burn for days or weeks and cover hundreds of miles until they encountered a natural fire break, such as a river, lake, ocean, or bay.

After the last ice age, Native Americans entered North America and were also responsible for igniting fires on the prairie. They recognized fire as a tool and used it to their advantage. The Native Americans were nomadic people and burning the tall grasses made traveling much easier. Additionally, they understood that the tender, green re-growth of grasses following a burn would attract game animals.


*Grasslands worldwide are "fire dependent" and require frequent exposure to the regenerative effects of fire.*

As Europeans settled throughout North America, natural fire regimes were slowly halted. Native Americans gradually disappeared from the land and much of the natural prairie habitat was settled and converted into towns and agricultural fields. Any wildfires that now occur are quickly subdued to protect life and property. Without grazing and fire, much of the remaining prairie habitat was transformed into shrub land and forested ecosystems.

***Prescribed Burning:***
*igniting a fire in a confined area of the prairie under specific weather conditions*

*Prescribed burning promotes public safety by removing accumulated dead fuel loads, which may cause catastrophic wildfires.*

## Foreign Invasion

Invasive species also play an important role in degrading prairie habitat. Transportation of exotic plants from other parts of the world for agricultural and botanical uses has become commonplace. However, when plants from other parts of the country are introduced into a new area, they often lack the set of checks and balances necessary to keep a species under control. Certain species become invasive if they exhibit adaptive strategies that allow them to out-compete native plants.

One harmful prairie invader is the Chinese tallow tree. This tree was imported from China in the late 1700's for the purpose of making soap, candles, and oil from the seeds. Unfortunately, Chinese tallow trees have impressive adaptive growth strategies that outcompete most plant species native to the U.S. Chinese tallow trees grow rapidly in almost any type of soil. Additionally, they produce a large number of seeds that can be viable for up to 10 years.

In 1999, approximately 123 billion dollars were spent fighting invasive species in the United States.

*This Chinese tallow monoculture has replaced one of the most diverse plant communities in North America with a non-native single species.*

***Invasive Species:*** *a non-indigenous species that adversely affects the habitats they invade economically, environmentally or ecologically.*

*Four of ABNC's most problematic prairie invaders:*

*Deep-rooted Sedge*

*Vasey Grass*

*Chinese Tallow Tree*

*McCartney Rose*

Birds and other animals ingest the seeds and help spread this exotic invader throughout southern North American forests and prairies. These trees compete with native prairie plants for nutrients, moisture, and sunlight. Within a few years, one of the most species rich ecosystems can be converted into a closed canopy Chinese tallow monoculture. The trees grow so close together that sunlight is unable to penetrate to the ground and reach the prairie grasses and wildflowers below, essentially creating a biological desert.

Humans have no doubt altered the prairie landscape forever. Never again will bison roam freely across the country removing woody and invasive plant species. Fire is no longer allowed to naturally sweep across the prairie stimulating an abundance of new plant growth. Each day new plants are introduced into this country from abroad with the potential threat of becoming the next exotic invader capable of outcompeting native vegetation. Furthermore, destruction of prairies due to urbanization, industrialization, and commercialization continues to be an ongoing threat to the few prairie remnants that remain. Although the destruction of prairie habitat by humans has been extensive, it is also up to humans to protect what is left.

## RESTORATION AND MANAGEMENT

Today, prairies are a human dependent ecosystem. In the absence of active management, a prairie will always turn into a shrub land or forest. Faced with the threat of even more prairie and other habitats being lost and degraded, a new branch of science emerged called restoration ecology.

***Restoration Ecology:***
*the science of renewing and restoring degraded ecosystems through human intervention.*

Successful restoration is a human act to implement a well thought out plan to achieve certain ecological goals. Implementing the restoration plan involves securing adequate funding to acquire needed materials, equipment and personnel. For prairies, it involves removing invasive species and reintroducing native plants and animals. Additionally, in the absence of natural ecological processes, landowners and conservationists must mimic the effects of grazing and fire to maintain prairie ecosystems.

ABNC actively manages 750 acres of coastal tallgrass prairie habitat throughout the preserve. Our prairie is divided into 25 acre management units that receive different annual treatments depending on location and habitat need. Many of the prairie units undergo manual removal of Chinese tallow trees with chainsaws or heavy machinery, and broadcast or spot treatment of invasive vegetation with herbicide. ABNC may mow specific prairie units in an attempt to mimic the grazing of bison. Additionally, certain units may be managed with prescribed fire. ABNC is the only permitted entity in Harris County to use prescribed fire.

The stewardship department has a larger goal of creating a habitat mosaic. The landscape is not managed uniformly, with the intent of creating different habitat types for different wildlife species. A recently burned management unit will be attractive to certain types of birds, such as snipe and white ibis, which need direct access to the soil to probe for invertebrates. The short, green grass created by a recently mowed unit provides a good browsing area for white-tailed deer and rodents. Additionally, units with standing cover are important for migrating winter birds, such as sparrows and wrens, which over-winter in the tall grass and for rodents that feed on the previous year's seeds.

ABNC is located in the Central Flyway and annually hosts over 220 bird species. Many birds fly great distances to reach their wintering grounds in coastal Texas, including the common snipe, which migrates over 3,500 miles to ABNC.

*This habitat mosaic is a landscape patchwork supporting a great diversity of wildlife species.*

## Bring Back the Natives

ABNC also reintroduces native plant species into the prairie. Volunteers, schools and community groups from around the area frequently participate in our service learning projects, where they assist in planting native grasses and forbs that were propagated in ABNC's native plant nursery. Our goal is to reintroduce the dominant grasses back into the prairie, along with many locally rare plant species. Staff and volunteers grow and install an average of 20,000 native grasses and wildflowers annually. In order to determine if ABNC's management efforts are successful, 32 sites are monitored in various prairie units on a biannual basis.

*Many of the plants which once covered the prairie have disappeared over time. ABNC grows locally rare grasses and wildflowers in the native plant nursery in an effort to restore this living museum to its original state.*

Some of the native grasses and wildflowers found throughout ABNC prairies include:

EASTERN GAMMA GRASS

TEXAS CONEFLOWER

YELLOW INDIAN GRASS

BLAZING STAR

BIG BLUESTEM

SNOW ON THE PRAIRIE

WHITE GAURA

LITTLE BLUESTEM

INDIAN PLANTAIN

SWITCHGRASS

IRON WEED

SUGAR CANE PLUME GRASS

## Prairie for the People

ABNC is home to one of the largest remnant prairie ecosystems around Galveston Bay. Furthermore, it is a publicly accessible prairie. Visitors may view this rare panorama from the Prairie Observation Platform, hike the prairie trail or ride along on a Prairie Hayride Wildflower Tour. The success of ABNC's prairies is not only dependent on visitation by community members, but also by their participation in helping to restore them.

*With only a few staff members, ABNC's stewardship department relies on volunteers and school groups to help with the installation of native plants into the prairie.*

# BENEFITS OF PRAIRIE HABITAT:

## Prairie Dependent Wildlife

It is difficult for restoration to return prairie entirely back to its native, pristine state. However, the benefits of restoration are apparent when native wildlife species begin to reappear. Many species of wildlife are dependent upon coastal tallgrass prairie and entire populations can be extirpated from an area with the loss of this essential habitat.

In 1900, over 1 million prairie chickens occupied coastal tallgrass prairies. Today they are one of the most critically endangered species in the world, with less than 50 individuals left in the wild.

## Mottled Ducks

Mottled ducks are a non-migratory duck that depend on tallgrass cover near a water source to nest and care for their young. They are endemic to Texas and Louisiana marshes and rely on adjacent tallgrass prairie habitat to reproduce. This species has experienced a 50% population decline in the past 40 years to due habitat loss and hunting pressure.


*Mottled ducks are one of only a few species of ducks that breed in Texas.*

## Box Turtles

Ornate box turtles are prairie dependent reptiles. These softball sized turtles spend their entire lives in prairie habitats, feeding on insects, worms, snails, grasses, wildflowers, and berries. Ornate box turtles have declined throughout their range mostly due to loss of prairie habitat. They are listed as a species of concern in Texas. It seems that agricultural practices and habitat loss have diminished ornate box turtle populations throughout the area around ABNC. No ornate box turtles have been seen recently within the nature center's prairies. However, the more forest -dependant relative of the ornate box turtle, the three-toed box turtle frequently inhabits ABNC prairies. It is common to see three-toed box turtles in prairie habitat near the woods edge.

*Box turtles have the ability to close themselves completely inside their shells. This is an advantage for a turtle whose habitat is often completely consumed by fire.*

## Prairie Kingsnakes

As their name implies, prairie kingsnakes are prairie dependent reptiles that play an important role in the grassland ecosystem. Prairie kingsnakes are considered dietary generalists and will consume mammals, birds, bird eggs, frogs, lizards, reptile eggs and snakes, including venomous snakes. It is because of this that their population numbers have remained stable. However, loss of prairie habitat is a continued threat to this unique grassland species.

*Prairie Kingsnakes are non-venomous and may rattle their tail or emit a foul odor to deter predators.*

## Loggerhead Shrikes

Loggerhead shrikes are predatory songbirds that rely on prairie habitat for survival. This species feeds mainly on insects, but will opportunistically take other prey species found the prairie, including small mammals, birds, and snakes. Loggerhead shrike populations have experienced significant decline throughout their range as a result of habitat loss. The National Audubon Society estimates that this species has experienced an 80% decline in the past 40 years.


*Loggerhead shrikes are often referred to as "butcher-birds". Because they lack talons, loggerhead shrikes will often impale their prey on thorns or even a barbed-wire fence to kill it.*

## White-tailed Kites

Prairies provide essential foraging habitat for many birds of prey. One unique raptor, the white-tailed kite, is specifically adapted for hunting in the prairie. They have the ability to hover in place while scanning the landscape for their main diet of rodents and other small mammals. White-tailed kites were threatened with extinction in North America during the early twentieth century due to hunting and egg collection. Although populations are now stable, loss of prairie habitat is a threat to the long term survival of the species.


*White-tailed kites are one of the only prairie-dependent birds of prey that nest at Armand Bayou Nature Center.*

## Gulf Fritillary

The gulf fritillary is a common sight in Texas coastal tallgrass prairies. These large butterflies serve as pollinators for many of our native wildflowers. Gulf fritillary caterpillars have a more specific diet and rely solely on passion flowers for survival to adulthood.


*Gulf fritillaries are a tropical species and range throughout the southern United States, South and Central America and the West Indies.*

# PRAIRIE RISING: Get Involved!

Armand Bayou Nature Center has numerous opportunities for volunteers to join in and help restore coastal tallgrass prairie habitat. Our "Prairie Friday" team meets every Friday morning to conduct various activities such as plant propagation, seed collection, and installation of plants into the prairie. With a little training you can also become a member of our volunteer burn team and assist staff in conducting prescribed burns. Our "Stewardship Saturday" group meets on the first and third Saturday of the month to conduct prairie activities, as well as other maintenance projects around the nature center. We also have an annual Prairie Pandemonium event occurring in October, where local residents join our volunteers in installing prairie plants. For more information visit www.abnc.org or call 281-474-2551.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